



Combined Science Physics Academic Overview 2018-19

Science						
	Term 1.1	Term 1.2	Term 2.1	Term 2.2	Term 3.1	Term 3.1
Year 9	Motion	Forces 1 Newton's Laws	Forces 2 Momentum and Safety	Energy	Waves	End of year assessment preparation and feedback
Year 10	EM Waves Radioactivity 1 Atoms and isotopes	Radioactivity 2 Nuclear decay and dangers	Electricity 1 Circuits and resistance	Electricity 2 Energy transfers and electrical safety	Magnetism	End of year assessment preparation and feedback
Year 11	Electricity 2 Energy transfers and electrical safety Magnetism Particle Model	Forces and matter and forces doing work	PPE 1 feedback and revision	PPE 2 preparation and feedback	Revision for GCSE examinations	



Year 11 Combined Science Physics Curriculum Content Overview 2018-19

Knowledge and Skills Students will be taught to....	Reading, Oracy, Literacy and Numeracy	Assessment
<ul style="list-style-type: none"> Recall, use and apply a variety of equations relating to electricity, magnetism, particles and energy Analyse and interpret information presented in a variety of forms including graphs, tables and written text Carry out practical activities in order to obtain results and explain their findings using correct scientific principles For each core practical explain; what equipment is used, how to carry out the practical, what is being changed (independent variable), what is being measured (dependent variable), what is being controlled and why Draw labelled diagrams of relevant practical equipment Describe and explain both mathematically and using scientific principles how current, potential difference and resistance are affected by different types of circuits and components Explain how energy is transferred in circuits and transmitted safely to homes and buildings Describe and explain the production and interaction of magnetic fields and how they can be used in motors and to produce electricity Describe the particle arrangement of solids, liquids and gases and relate this to the density of different materials Explain the reasons behind the different energy transfers during an increase in temperature and a change in state of a substance and relate these to the relevant equations Explain the relationship between temperature and pressure of gases Explain the relationship between force and extension of a spring and the different energy transfers that take place 	<p style="text-align: center;">Reading</p> <ul style="list-style-type: none"> Edexcel combined science text book Recommended reading texts CGP revision guide PLC checklists <hr/> <p style="text-align: center;">Numeracy</p> <ul style="list-style-type: none"> Recall of key values and quantities Recall, use and application of equations Conversion between units Working with numbers in standard form Drawing appropriate graphs and tables with suitable scales/ headings and plotting/ recording data Describing mathematical patterns in experimental data and explaining them using scientific concepts Perform calculations based on extracting data from both tables and graphs <hr/> <p style="text-align: center;">Oracy and Literacy</p> <ul style="list-style-type: none"> Key words Writing a method for core practicals Six mark questions 	<p style="text-align: center;">Formative</p> <ul style="list-style-type: none"> Questioning in lessons Live student performance in lessons followed by questions Whole class feedback during lessons Regular peer and self assessment Book checks for general presentation, work completion and spellings Low stakes quizzing Learning checkpoints in between main assessments <p style="text-align: center;">Summative</p> <ul style="list-style-type: none"> 3 cumulative assessments throughout the year



Assessment Skills, Knowledge and Concepts Map

Key learning questions	Edexcel Combined Science Physics Year 11 Assessment Phase 1
	Electricity 2 Energy transfers and electrical safety
<ul style="list-style-type: none"> <input type="checkbox"/> Describe the energy transfer that takes place in a kettle and a battery operated fan <input type="checkbox"/> What is an advantage and disadvantage of the heating effect in an electrical circuit? <input type="checkbox"/> What is a power rating? <input type="checkbox"/> How do potential difference and current relate to power? <input type="checkbox"/> What is an alternating current and how is it produced? <input type="checkbox"/> What is the frequency and potential difference of a UK domestic mains supply? <input type="checkbox"/> What is the purpose of the different wires in a plug? <input type="checkbox"/> How do fuses and circuit breakers work? 	<ul style="list-style-type: none"> <input type="checkbox"/> Describe power as the energy transferred per second and recall that it is measured in watt <input type="checkbox"/> Recall and use the equation: $P = E/t$, $P = I \times V$ and $P = I^2 \times R$, use the equation $E = I \times V \times t$ <input type="checkbox"/> Explain how the power transfer in any circuit device is related to potential difference and current <input type="checkbox"/> Describe examples of the relationship between power ratings and energy transfers for domestic devices <input type="checkbox"/> Describe how, in domestic devices, energy is transferred from batteries, a.c. mains motors and heating devices <input type="checkbox"/> Explain the difference between direct and alternating voltage <input type="checkbox"/> Describe what direct current (d.c.) is and recall the objects that supply it <input type="checkbox"/> Describe what alternating current (a.c.) is and recall the frequency and voltage in the UK <input type="checkbox"/> Explain the difference in function between the live, neutral and earth wire of a three-core electrical cable and recall the potential differences between each wire <input type="checkbox"/> Explain the function of an earth wire and of fuses or circuit breakers in ensuring safety <input type="checkbox"/> Explain why switches and fuses should be connected in the live wire of a domestic circuit <input type="checkbox"/> Explain the dangers of providing any connection between the live wire and earth
Key learning questions	Magnetism and the Motor Effect
<ul style="list-style-type: none"> <input type="checkbox"/> What is a magnetic field and which direction does it point? <input type="checkbox"/> How can you observe a magnetic field? <input type="checkbox"/> Explain what happens when you bring two magnets close together <input type="checkbox"/> What is the difference between a temporary and induced magnet? <input type="checkbox"/> What shape is the field around a current carrying wire? <input type="checkbox"/> How do you increase the strength of the field around a wire and how does this change when it is wrapped into a solenoid? <input type="checkbox"/> What is the motor effect? <input type="checkbox"/> What is Fleming's left hand rule and what does it show? <input type="checkbox"/> What is electromagnetic induction and how is it caused? <input type="checkbox"/> How do you increase the size of an induced p.d? <input type="checkbox"/> What is a transformer and where would you find them? <input type="checkbox"/> What is the national grid? <input type="checkbox"/> Why are different transformers used in the national grid? <input type="checkbox"/> How is energy lost in the national grid? 	<ul style="list-style-type: none"> <input type="checkbox"/> Describe the interactions between like and unlike magnetic poles <input type="checkbox"/> Explain the difference between permanent and induced/ temporary magnets and describe their uses <input type="checkbox"/> Describe the shape, direction and strength of the magnetic field around bar magnets and for a uniform field <input type="checkbox"/> Describe how to observe the shape and direction of a magnetic field and how the behaviour of plotting compasses are related to evidence that the core of the Earth must be magnetic <input type="checkbox"/> Describe how to show that a current can create a magnetic effect around a long straight conductor <input type="checkbox"/> Describe the shape and direction of a magnetic field around a conductor relating to the direction of the current <input type="checkbox"/> Recall that the strength of the field depends on the size of the current and the distance from the conductor <input type="checkbox"/> Explain how inside a solenoid the fields from individual coils can add together or cancel <input type="checkbox"/> HT ONLY: Explain how magnetic forces are due to interactions between magnetic fields <input type="checkbox"/> HT ONLY: Recall that a current carrying conductor and a magnetic will experience an equal and opposite force when placed near each other <input type="checkbox"/> HT ONLY: Recall and use Fleming's left-hand rule to represent the relative directions of the force <input type="checkbox"/> HT ONLY: Use the equation: $F = B \times I \times l$ <input type="checkbox"/> HT ONLY: Explain how the force on a conductor in a magnetic field is used to cause rotation in electric motors <input type="checkbox"/> Explain why, in the national grid, electrical energy is transferred at different voltages <input type="checkbox"/> Explain where and why step-up and step-down transformers are in the national grid <input type="checkbox"/> Use the power equation (for transformers with 100% efficiency): $V_p \times I_p = V_s \times I_s$



Key learning questions	Particle Model
<ul style="list-style-type: none"> <input type="checkbox"/> How does the arrangement of particles affect the density of an object? <input type="checkbox"/> How do you measure the density of an object? <input type="checkbox"/> What are the differences between each state of matter? <input type="checkbox"/> What is meant by the internal energy of a system? <input type="checkbox"/> What happens to the particles when the temperature of a substance increases and when it changes state? <input type="checkbox"/> What is absolute zero? <input type="checkbox"/> What is specific heat capacity and how can you determine its value for water? <input type="checkbox"/> What is latent heat and how is it different from specific heat capacity? <input type="checkbox"/> What causes pressure in a gas? <input type="checkbox"/> How do you increase the pressure of a gas? <input type="checkbox"/> How is temperature related to gas pressure? 	<ul style="list-style-type: none"> <input type="checkbox"/> Use a simple kinetic theory model to explain the different states of matter <input type="checkbox"/> Recall and use the equation: $\rho = m/V$ <input type="checkbox"/> Core Practical: Investigate the densities of solid and liquids <input type="checkbox"/> Explain the differences in density between the different states of matter in terms of particle arrangement <input type="checkbox"/> Name and describe the physical changes of state and the differences between chemical changes <input type="checkbox"/> Explain how heating a system will change the energy stored within the system <input type="checkbox"/> Explain how a change in the energy store of a system can affect temperature at the state of the material <input type="checkbox"/> Define the terms specific heat capacity and specific latent heat and explain the differences between them <input type="checkbox"/> Use the equation: $\Delta Q = m \times c \times \Delta\theta$ <input type="checkbox"/> Use the equation: $Q = m \times L$ <input type="checkbox"/> Explain ways of reducing unwanted energy transfers through thermal insulation <input type="checkbox"/> Core Practical: Investigate the properties of water by determining its specific heat capacity <input type="checkbox"/> Explain the pressure of a gas in terms of the motion of its particles <input type="checkbox"/> Explain the effect of changing the temperature of a gas on the velocity of its particles and hence on the pressure <input type="checkbox"/> Describe the term absolute zero, $-273\text{ }^\circ\text{C}$, in terms of movement of particles <input type="checkbox"/> Convert between the kelvin and Celsius scales <input type="checkbox"/> HT ONLY: Explain why doing work on a gas can increase its temperature, including a bicycle pump

Key learning questions	Edexcel Combined Science Physics Year 11 Assessment Phase 2
	Forces and Matter
<ul style="list-style-type: none"> <input type="checkbox"/> What is needed to cause either compression or extension? <input type="checkbox"/> What is meant by elastic and inelastic distortion? <input type="checkbox"/> When is the relationship between force and extension linear and when is it non-linear? <input type="checkbox"/> How do you determine the work done in stretching a spring using an equation or a graph? <input type="checkbox"/> How can you investigate force and extension for different springs? 	<ul style="list-style-type: none"> <input type="checkbox"/> Explain, using springs and other elastic objects, that stretching, bending or compressing an object requires more than one force <input type="checkbox"/> Describe the difference between elastic and inelastic distortion <input type="checkbox"/> Recall and use the equation for linear elastic distortion including calculating the spring constant: $F = k \times x$ <input type="checkbox"/> Use the equation to calculate the work done in stretching a spring: $E = \frac{1}{2} k \times x^2$ <input type="checkbox"/> Describe the difference between linear and non-linear relationships between force and extension <input type="checkbox"/> Core Practical: Investigate the extension and work done when applying forces to a spring



Key learning questions	Forces Doing Work and Their Effects
<ul style="list-style-type: none"> <input type="checkbox"/> What is a closed system? <input type="checkbox"/> How do you draw an energy transfer diagram? <input type="checkbox"/> What is work done? <input type="checkbox"/> What are the equations for gravitational potential energy and kinetic energy? <input type="checkbox"/> What are some examples of when energy is dissipated and stored in less useful ways? <input type="checkbox"/> How do mechanical processes become wasteful? <input type="checkbox"/> How does lubrication reduce unwanted energy transfers? <input type="checkbox"/> How do you calculate the efficiency of a device? <input type="checkbox"/> What is meant by power and what is it measured in? <input type="checkbox"/> What is meant by 'contact' and 'non-contact' forces and what are some examples? <input type="checkbox"/> HT Only: what is a free body diagram and how would you draw one? <input type="checkbox"/> HT Only: how do you draw a scale vector diagram and how can you use this to find a resultant force? <input type="checkbox"/> HT Only: how can you resolve a force into its horizontal and vertical components? 	<ul style="list-style-type: none"> <input type="checkbox"/> Describe the changes involved in the way energy is stored when systems change and represent using diagrams <input type="checkbox"/> Explain that where there are energy transfers in a closed system there is no net change to the total energy <input type="checkbox"/> Identify the different ways that the energy of a system can be changed through work done by forces, in electrical equipment and in heating <input type="checkbox"/> Describe how to measure the work done by a force and recall that energy transferred (joule, J) is equal to work done (joule, J) <input type="checkbox"/> Recall and use the equation: $E = F \times d$ <input type="checkbox"/> Describe and calculate the changes in energy involved when a system is changed by work done by forces <input type="checkbox"/> Recall and use the equation to calculate the change in gravitational PE when an object is raised above the ground <input type="checkbox"/> Recall and use the equation to calculate the amounts of energy associated with a moving object: $KE = \frac{1}{2} \times m \times v^2$ <input type="checkbox"/> Explain, using examples, how in all system changes energy is dissipated so that it is stored in less useful ways <input type="checkbox"/> Explain that mechanical processes become wasteful when they cause a rise in temperature <input type="checkbox"/> Define power as the rate at which energy is transferred and use examples to explain this definition <input type="checkbox"/> Recall and use the equation: $P = E/t$ <input type="checkbox"/> Recall what one Watt is equal to <input type="checkbox"/> Recall and use the efficiency equation <input type="checkbox"/> Describe, with examples, how objects can interact with and without contact <input type="checkbox"/> Explain the difference between vector and scalar quantities using examples <input type="checkbox"/> HT ONLY: Use vector diagrams to illustrate resolution of forces, a net force, and equilibrium situations <input type="checkbox"/> HT ONLY: Draw and use free body force diagrams <input type="checkbox"/> HT ONLY: Explain examples of the forces acting on an isolated solid object or a system where several forces lead to a resultant force <input type="checkbox"/> Explain ways of reducing unwanted energy transfer through lubrication